

REMARKS

The Final Office Action of April 21, 2004, and the Advisory Action dated July 20, 2004, have been received and reviewed.

Claims 1-7, 9-24, and 26-44 are currently pending and under consideration in the above-referenced application. Each of claims 1-7, 9-24, and 26-44 stands rejected.

Reconsideration of the above-referenced application is respectfully requested.

Rejections Under 35 U.S.C. § 103(a)

Each of claims 1-7, 9-24, and 26-44 has been rejected under 35 U.S.C. § 103(a).

The standard for establishing and maintaining a rejection under 35 U.S.C. § 103(a) is set forth in M.P.E.P. § 706.02(j), which provides:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure.

In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Hultmark in View of Cobbley

Claims 1-7, 9-16, 41, and 42 stand rejected under 35 U.S.C. § 103(a) for reciting subject matter which is purportedly unpatentable over the subject matter taught in U.S. Patent 6,232,667 to Hultmark et al. (hereinafter "Hultmark"), in view of the teachings of U.S. Patent 6,064,120 to Cobbley et al. (hereinafter "Cobbley").

Independent claim 1 is directed to a method of interconnecting at least two semiconductor dice. The method of independent claim 1 includes, among other things, orienting a first semiconductor die and at least one second semiconductor die such that the active surfaces thereof face one another. This act of "orienting" includes "aligning a peripheral edge of the at least one

semiconductor die . . .” Independent claim 1, as amended and presented herein, also recites that the alignment structure interacts with the peripheral edge of the at least one second semiconductor die.

Hultmark teaches, among other things, an assembly that includes a semiconductor device, or “chip 30,” that has been secured to a substrate 20 in flip-chip type arrangements. The Office has asserted that the substrate include elements 31 and 32 that function as alignment structures that interact with a peripheral edge of chip 30. Final Office Action, page 6. In reality, elements 31 and 32 are respectively the pads 31 of a substrate 20 and solder bumps 32 that have been secured to pads 31. Hultmark, col. 5, lines 35-43. While pads 31 and solder bumps 32 are necessary to stack chip 30 on substrate 20 (*see id.*),

Therefore, Hultmark neither teaches nor suggests that either pads 31 or bumps 32 interact with a peripheral edge of chip 30, as is required of the “alignment structure” recited in amended independent claim 1.

Cobbley also lacks any teaching or suggestion of a method that includes “aligning a peripheral edge of . . . at least one second semiconductor die with an alignment structure disposed on the active surface of [a] first semiconductor die . . .” or of an alignment structure that interacts with a peripheral edge of at least one second semiconductor die.

Therefore, it is respectfully submitted that Hultmark and Cobbley, taken either separately or together, do not teach or suggest each and every element of amended independent claim 1.

Each of claims 2-7, 9-16, 41, and 42 is allowable, among other reasons, for depending either directly or indirectly from claim 1, which is allowable.

Hultmark in View of Cobbley and, Further, in View of Buckley

Claims 17, 18, 20-24, 26-34, and 36-38 stand rejected under 35 U.S.C. § 103(a) for being directed to subject matter which is allegedly unpatentable over teachings from Hultmark, in view of the teachings of Cobbley and, further, in view of the subject matter taught in U.S. Patent 5,477,082 to Buckley, III, et al. (hereinafter “Buckley”).

Claims 17, 18, and 20-22 are each allowable, among other reasons, for depending indirectly from claim 1, which is allowable.

Independent claim 23 is drawn to a method for packaging a semiconductor device assembly. The method of independent claim 23 includes “orienting . . . at least one second semiconductor die over [a] first semiconductor die . . . by aligning a peripheral edge of the at least one second semiconductor die with an alignment structure disposed on the active surface of the first semiconductor die . . .” As amended, independent claim 23 also recites that, during the act of “orienting,” the alignment structure interacts with the peripheral edge of the at least one second semiconductor die.

As noted previously herein, neither Hultmark nor Cobbley, taken either together or separately, teaches or suggests that, in orienting first and second dice relative to one another, an alignment structure disposed on the active surface of a first semiconductor die interacts with the peripheral edge of the second semiconductor die.

The multi-chip module shown in FIG. 4 of Buckley includes two semiconductor device components 56 and 58 that are electrically connected to one another by way of an intervening flexible carrier 60. Solder bumps 66 and 72 are secured to bond pads 64 and 68 of semiconductor device components 56 and 58, respectively. Solder bumps 66 and 72 are respectively secured to pads 76 and 74 that communicate with one another and which are located on opposite surfaces of flexible carrier 60.

In this regard, Hultmark does not include any teaching or suggestion of any type of alignment feature on either substrate 20 or chip 30 thereof.

Cobbley teaches a semiconductor die that includes recessed bond pads, but lacks any teaching or suggestion that such recessed bond pads are useful for aligning the semiconductor die with a substrate, let alone for aligning a peripheral edge of the semiconductor die.

Buckley lacks any teaching or suggestion of an alignment structure for aligning with a peripheral edge of either semiconductor device component 56, 58. Instead, the teachings of Buckley with respect to alignment, which are located at col. 7, lines 1-22, thereof, are that solder paste may be used to temporarily hold, and pre-align, semiconductor device components 56 and 58 on flexible carrier 60 and that, following solder reflow, the resulting solder bumps 66 and 72 permanently align semiconductor device components 56 and 58 with flexible carrier 60. As the solder paste and solder bumps are never associated with a peripheral edge of either

semiconductor device component 56, 58, they do not align with a peripheral edge of either semiconductor device component 56, 58, as is required by independent claim 23.

Thus, none of the features that are described in Hultmark, Cobbley, or Buckley interacts with the peripheral edge of a semiconductor die to align the same relative to another semiconductor die, as would be required to render amended independent claim 23 obvious under 35 U.S.C. § 103(a).

Accordingly, it is respectfully submitted that, under 35 U.S.C. § 103(a), independent claim 23 recites subject matter which is allowable over that taught in Hultmark, Cobbley, and Buckley.

Claims 24, 26-34, and 36-38 are each allowable, among other reasons, for depending either directly or indirectly from claim 23, which is allowable.

Hultmark, Cobbley, Buckley, and Baba

Claims 19 and 35 have been rejected under 35 U.S.C. § 103(a) for being drawn to subject matter which is assertedly unpatentable over the teachings of Hultmark, in view of the subject matter taught in Cobbley and Buckley and, further, in view of teachings from U.S. Patent 6,317,333 to Baba (hereinafter “Baba”).

Claim 19 is allowable, among other reasons, for depending indirectly from claim 1, which is allowable.

Claim 35 is allowable, among other reasons, for depending indirectly from claim 23, which is allowable.

Hultmark in View of Cobbley and, Further in View of Yu

Claims 39, 40, 43, and 44 are rejected under 35 U.S.C. § 103(a) for reciting subject matter which is purportedly unpatentable over the teachings of Hultmark, in view of the subject matter taught in Cobbley and, further, in view of teachings from U.S. Patent 6,100,593 to Yu et al. (hereinafter “Yu”).

Independent claim 39 recites a method for packaging a semiconductor device assembly. The method of independent claim 39 includes providing at least a first multi-chip module. The

first multi-chip module includes a first semiconductor die and at least one second semiconductor die. The at least one second semiconductor die includes “at least one peripheral edge . . . aligned with an alignment structure disposed on the active surface of the first semiconductor die . . .” Further, the alignment structure of independent claim 39, as amended and presented herein, interacts with at least one peripheral edge of the at least one second semiconductor die to align the dice relative to one another.

Again, Hultmark and Cobbley lack any teaching or suggestion that at least one peripheral edge of at least one second semiconductor may interact with an alignment structure that is disposed on an active surface of a first semiconductor die. Thus, Hultmark and Cobbley both lack any teaching or suggestion of providing a multi-chip module that includes such an arrangement of semiconductor dice.

Yu is also devoid of any teaching or suggestion of providing a multi-chip module that includes a first semiconductor die with an alignment structure on an active surface thereof that interacts with at least one peripheral edge of a second semiconductor die.

It is, therefore, respectfully submitted that Hultmark, Cobbley, and Yu, taken either collectively or individually, do not teach or suggest providing a multi-chip module in which “at least one peripheral edge of . . . at least one second semiconductor die [is] aligned with an alignment structure disposed on the active surface of [a] first semiconductor die and interacting with the at least one peripheral edge of the at least one second semiconductor die,” as would be required to establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a) against independent claim 39.

Claims 40, 43, and 44 are each allowable, among other reasons, for depending either directly or indirectly from claim 39, which is allowable.

CONCLUSION

It is respectfully submitted that each of claims 1-7, 9-24, and 26-44 is allowable. An early notice of the allowability of each of these claims is respectfully solicited, as is an indication that the above-referenced application has been passed for issuance. If any issues preventing

allowance of the above-referenced application remain which might be resolved by way of a telephone conference, the Office is kindly invited to contact the undersigned attorney.

Respectfully submitted,



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